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E7.3 10583

CR-131899

Type I Progress Report

Mar. 16, 1973 - May 15, 1973

Utilizing ERTS-A Imagery for Tectonic Analysis Through Study of Big Horn
Mountains Region. MMC #256
ERTS Contract #NAS5-21852

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At the present time we have no problems other than that of time to adequately
work through the abundant material we now have and continue to receive.

We have received a color composite of scene 1048-17234 which was ordered
on Nov. 6, 1972. The quality of this composite is excellent. Variations due
to vegetation difference are quite enhanced and will be very useful to Baker
this summer. The red beds of the Triassic Chugwater formation stand out sharply
in yellow. An overlay of the Wyoming geologic map at the same scale of the
composite shows that, in places, we can improve on the mapping at this scale
of the Chugwater, particularly the lower contact. In addition several pediment
benches on the east side of the Bighorns stand out more clearly than on black
and white. Hopefully, the composites we ordered in March will get to us soon
enough to use in the field this summer; we would appreciate expediting this
request if at all possible.

We have received the "dodged" positive prints ordered earlier. We find
these prints make a more even-appearing mosaic. There is a slight enhancement
of tonal detail in the Bighorn basin but a slight reduction in tonal detail
and topographic resolution in the mountains.

We are continuing the analysis of the U-2 photography. The green band is
too bright in the basins to be of much use. The red band is the best of the
three for the uplifts while the infrared gives the best detail in the basins.
The 70 mm color-infrared provides quite good detail. The stereo coverage in
all flights is particularly helpful. The 9 X 9 aerochrome infrared is parti-
cularly useful; it is of interest to note that its color characteristics are
rather similar to the NASA color composite, thus facilitating comparison.

The supporting flight by the Colorado State Flight Facility was scheduled
for May 14-15, weather permitting.

On March 21, 1973 a Data request Form was sent to order some winter scenes
selected from the catalogue and for color composites of the best fall imagery.
The winter scenes were just received on May 15. A quick look at these showed a
number of excellent scenes of varying snow-cover. A particularly good sequence
taken in early December when the entire area was snow covered revealed a con-
siderable topographic enhancement due both to the snow cover and to the lower
sun angle. Except for the lower resolution of band 4, all bands look very much
alike because of the snow. In this group we also have finally filled in the
area centered on the southern Black Hills for which we had poor coverage due to
cloud cover.

We are now just beginning to receive some spring imagery.

(E73-10583) UTILIZING ERTS-A IMAGERY FOR
TECTONIC ANALYSIS THROUGH STUDY OF BIG
HORN MOUNTAINS REGION Progress Report,
16 Mar. - 15 May 1973 (Iowa Univ.) 3 p
HC \$3.00

N73-23443

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CSCL 08E G3/13

In the next two months we shall be examining the winter and spring imagery, doing further analysis on the U-2 material, and, hopefully, analyzing the lower altitude (30,000') flight strips.

The following is a summary of the field checking program scheduled for this summer: (All will have conventional high altitude black and white photography and topographic maps in addition to ERTS imagery).

1. P.I. Richard A. Hoppin - will be checking some linears in the Black Hills and in portions of the Bighorns not covered by others.
2. C.I. Lon Drake - will be looking at glacial features in the Tensleep Creek drainage and along the eastern high slopes of the Bighorns.
3. C.I. Richard Baker - will be checking vegetation in selected areas of the Bighorn region. He will in addition be using the color composites and the U-2 aerochrome infrared photography.
4. Graduate research assistant Ron Manley - will be studying known and suspected linears in and around the Cloud Peak area.
5. Graduate student Dan Tappmeyer - will be field checking several linears, stratigraphy, and structures in the Nowood area of the southeastern Bighorn basin and adjoining range.
6. Graduate student Alan Swenson - will be field checking along known portions and suspected extensions of the Tensleep Lineament and adjacent areas. He will also have the U-2 strip along this zone.
7. Graduate student Nels Voldseth - will be doing mainly a structural problem in the Cottonwood Creek area, northwest flank of the Bighorns. He will check out several linears that cross his area.

Each investigator will be in the field 5 to 8 weeks.

Summary of significant results (3K)

NASA - provided color composite (1048-17234) which includes the southeastern portion of The Bighorn Mountains and the western Powder River basin is of excellent quality. The considerable variations in the red hues indicate that vegetational mapping will be enhanced over the black and white. Some additional delineation of rock units can be made, particularly the Chugwater formation. Preliminary look at just received winter scenes indicates that topographic features are enhanced both due to the snow cover and to the lower sun angle.